



Figure 1.4

house quotes are called “house odds” or “payout odds.” The house odds are always lower than the true odds. For example, in the above situation, they may quote you 6 to 2 instead of 7 to 2, for they then need only pay \$6 not \$7 for your \$2 if you win.

Consider the roulette wheel used in the North American casinos. This wheel is divided into 38 equal sectors numbered 1 through 36, and 0 and 00. Suppose you bet on any single number, say 1 – betting is permitted on any of the 38 numbers. Then your true odds are 37 to 1. The house odds are 35 to 1. So, if you win, they give you 35 times your wager instead of 37 times and also your wager of 1. What this means is that, on the average, you recoup your loss of 1 in each of 35 spins; only in two spins you lose 1 each. That is, the casino extracts a profit of two times your wager once every 38 spins of the wheel. So the casino’s profit is  $2/38 = 5.26\%$  – this is called the house edge in roulette. An easier way to see this is by considering that each wager costs \$1. Then, on each spin you win \$35 with probability  $1/38$ , but you lose \$1 with probability  $37/38$ . So the average net result of a spin is

$$(1/38)\$35 + (37/38)(-\$1) = \$(35 - 37)/38 = -\$2/38.$$

You can see that the casino can make money only by setting the payment at less than \$37 to winner. If they paid you \$37, they make no money and